

# CONTINUING EDUCATION MATHEMATICS DEPARTMENT

**PART A:** Fill in the blanks. Write your answer in the space provided.

- 1) Given points A(-4, 5) and B(2, -3), determine:

a)  $\vec{BA} =$  \_\_\_\_\_

b)  $\left| \vec{AB} \right| =$  \_\_\_\_\_

- 2) Suppose  $\vec{a} = [1, 2, -2]$ ,  $\vec{b} = [2, -1, 3]$  and  $\vec{c} = [-2, -1, 3]$ . Determine:

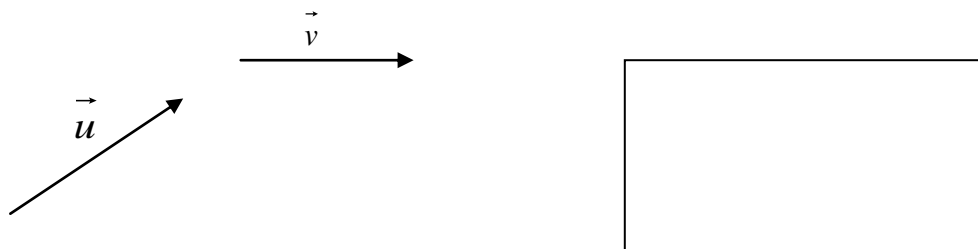
a)  $\vec{a} \bullet (\vec{b} + \vec{c}) =$  \_\_\_\_\_

b) vector perpendicular to  $\vec{a}$  and  $\vec{b} =$  \_\_\_\_\_

- 3) If  $\vec{AB} = [1, 2, -4]$  and point B has coordinates  $B\left(-4, \frac{1}{2}, -2\right)$  determine the coordinates of A. \_\_\_\_\_

- 4) If  $\vec{a} = [2, -3m, -1]$  and  $\vec{b} = [4, -1, m]$ , for what value of m is  $\vec{a}$  perpendicular to  $\vec{b}$ . \_\_\_\_\_

- 5) Given the following vectors, draw the vector that represents  $\vec{v} - \vec{u}$ .



- 6) If  $\vec{a} = [4, 2, 1]$  and  $\vec{b} = [-2, -1, 3]$ , determine  $\vec{b} \times \vec{a}$  \_\_\_\_\_

- 7) Write the vector equation for the line given by the symmetric equations  $\frac{x-4}{3} = \frac{y+1}{-2} = z-7$  \_\_\_\_\_

NAME: \_\_\_\_\_

Page 2 of 6

- 8) Write the parametric equations for the line passing through the point  $(-2, 4)$  and perpendicular to  $\vec{m} = [3, -1]$

\_\_\_\_\_

- 9) State the normal for the plane  $3 - 5y + 7z + 2x = 0$

\_\_\_\_\_

- 10) When is  $\vec{u} \cdot \vec{v}$  negative?

\_\_\_\_\_

- 11) Name the vector that is equivalent to  $\vec{BC} - \vec{DC} - \vec{ED}$

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- 12) Find the directional cosines of vector  $[2, -4, 1]$   
*To the nearest degree.*

$\alpha =$  \_\_\_\_\_

$\beta =$  \_\_\_\_\_

$\chi =$  \_\_\_\_\_

**Part B: Short Answer Questions**

- 1) Calculate the angles *to the nearest degree* of triangle ABC with vertices A ( 5 , -3 ) , B ( 1 , 8 ) and C ( 1 , -2 ). What type of triangle is ABC?

- 2) Determine if the points A ( -2 , 2 , 7 ) , B ( 6 , -2 , 1 ) and C ( -6 , 4 , 10 ) are collinear.
- 3) Calculate the area of the parallelogram *to two decimal places* determined by each pair of vectors.  
 $\vec{a} = [-1, 1, 2]$  and  $\vec{b} = [0, 3, 4]$

- 4) Find parametric equations of the line of intersection of the following planes.

$$\pi_1 : 3x - y + 4z = 7$$

$$\pi_2 : x + y - 2z + 5 = 0$$

- 5) A plane is flying on a bearing of  $60^\circ$  at a constant speed of 800 km/h. If the velocity of the wind is 120 km/h on a bearing of  $123^\circ$ , what is the velocity of the plane relative to the ground?  
***Round final answers to one decimal place.***

NAME: \_\_\_\_\_

Page 5 of 6

**Part C: Problem Solving**

Show all your work, providing neat and clear solutions in the space provided.

- 1) Determine the scalar equation of the plane that contains the intersecting lines;

$$\frac{x-2}{1} = \frac{y}{2} = \frac{z+3}{3} \quad \text{and} \quad \frac{x-2}{-3} = \frac{y}{4} = \frac{z+3}{2}$$

- 2) Enrico performs a high wire act at the circus. During his act, he stands on a 25 m wire, 10 m from one platform and 15 m from a second platform. The distance between the two platforms is 20 m. Find the tensions being exerted in each of the two sections of the wire if Enrico has a mass of 55 Kg. [N.B. Assume that a 1 Kg mass exerts a force of 9.8 N].

***Round all answers to one decimal place.***

- 3) Give a geometric interpretation of the following system of equations. Show your work.

$$\pi_1: \quad 2x + 3y - 5z = 9$$

$$\pi_2: \quad 5x - y + 2z = -3$$

$$\pi_3: \quad -x + 7y - 12z = 21$$